

CLAIMS

1. An inorganic-organic hybrid film-coated stainless steel foil comprising a stainless steel foil substrate having coated on one surface or both surfaces thereof an inorganic-organic hybrid film, wherein said inorganic-organic hybrid film comprises a skeleton formed of an inorganic three-dimensional network structure mainly comprising a siloxane bond, with at least one crosslinked oxygen of said skeleton being replaced by an organic group and/or a hydrogen atom, and the ratio [H]/[Si] between hydrogen concentration [H] (mol/l) and silicon concentration [Si] (mol/l) in said film satisfies the condition of $0.1 \leq [H]/[Si] \leq 10$.

2. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 1, wherein said organic group is one or more member selected from an alkyl group, an aryl group, a hydroxyl group, a carboxyl group and an amino group.

3. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 1 or 2, wherein the average roughness R_{af} of the surface of said inorganic-organic hybrid film satisfies the condition of $R_{af} \leq 0.02 \mu\text{m}$.

4. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 1 to 3, wherein the thickness T_f of said inorganic-organic hybrid film satisfies the condition of $0.05 \mu\text{m} \leq T_f \leq 5 \mu\text{m}$.

5. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 1 to 4, wherein the thickness T_f of said inorganic-organic hybrid film and the thickness T_s of said stainless steel foil substrate satisfy the condition of $T_f \leq T_s/20$.

6. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 1 to 5, wherein the thickness T_f of said inorganic-organic hybrid film and the average roughness R_{as} of the surface

of said stainless steel foil substrate satisfy the condition of $R_{as} \leq T_f/2$.

5 7. An inorganic-organic hybrid film-coated stainless steel foil comprising a stainless steel foil having coated thereon a plurality of inorganic-organic hybrid films each mainly comprising a siloxane bond, wherein at least a part of Si constituting each inorganic-organic hybrid film is chemically bonded to one or both of an organic group and hydrogen, provided that
10 the uppermost layer out of said plurality of inorganic-organic hybrid films may be an inorganic SiO_2 film, and adjacent films of said plurality of inorganic-organic hybrid films (including the inorganic SiO_2 film) differ in the composition from each other.

15 8. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 7, wherein out of said plurality of inorganic-organic hybrid films, the thermal expansion coefficient of the upper inorganic-organic hybrid film is smaller than the thermal expansion
20 coefficient of the lower inorganic-organic hybrid film.

9. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 7 or 8, wherein the uppermost film is an SiO_2 film.

25 10. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 7 or 8, wherein the uppermost inorganic-organic hybrid film is an inorganic-organic hybrid film in which at least a part of the Si constituting the film is bonded to hydrogen but is not bonded to an organic group.

30 11. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 10, wherein the molar ratio of H/Si in said uppermost inorganic-organic hybrid film is 1.0 or less.

35 12. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 11, wherein said uppermost inorganic-organic hybrid film has a thickness of 0.5 μm or less.

13. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 12, wherein out of said plurality of inorganic-organic hybrid films, the lowermost inorganic-organic hybrid film
5 is an inorganic-organic hybrid film in which at least a part of Si constituting the film is bonded to an alkyl group having a carbon number of 1 to 4.

14. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 13, wherein said
10 alkyl group is a methyl group.

15. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 14, wherein the molar ratio of methyl group/Si in said lowermost inorganic-organic hybrid film is from 0.2 to 1.0.

15 16. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 15, wherein said lowermost inorganic-organic hybrid film has a thickness of 0.5 to 5 μm .

20 17. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 16, which further comprises an inorganic-organic hybrid film having a medium thermal expansion coefficient between the uppermost inorganic-organic hybrid film having a small thermal expansion coefficient and the
25 lowermost inorganic-organic hybrid film having a large thermal expansion coefficient.